ROCKS and MINERALS

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Edited and Published by PETER ZODAC

APRIL 1939

Contents for April, 1939

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ROCKS and MINERALS PEEKSKILL, N. Y., U. S. A.

The Official Journal of the Rocks and Minerals Association

Chips from the Quarry

PETER ZODAC

Mineralogy Goes On The Air

Mr. and Mrs. William Otersen, members of the Rocks and Minerals Association and of the New Haven Mineral Club, who reside in West Haven, Conn., gave a very interesting and instructive talk over Station WICC, New Haven, Conn., on Wed., Feb. 15th, 1939, from 8:00-8:15 p. m. We regret we received notice of this broadcast too late to announce it in ROCKS AND MINERALS.

Their presentation of the subject of minerals and collecting was fascinating and profitable for all those listeners-in who were or might be interested in the subject of mineralogy or who may never have heard of mineralogy before. May we express to both, Mr. and Mrs. Otersen, our appreciation of their aid and assistance in thus encouraging an interest in one of nature's most charming and interesting fields of study. They were kind enough in their broadcast to mention ROCKS AND MINERALS as "The finest magazine on minerals in the country".

We should also like to thank Station WICC for sponsoring this very interesting broadcast. There are so many interesting angles from which mineralogy may be presented—educationally, commercially, or as a hobby —Station WICC may find something more in this field worthy of presenting to their audiences on future occasions.

Proposed Dealers Convention

A number of dealers advertising in ROCKS AND MINERALS have expressed an interest in a dealers convention where they might meet one another, become acquainted, and at the same time iron out many problems that confront each and every one of them. Among the problems are:

Popularizing mineralogy.
Increasing sales of minerals.
Standardizing prices and methods.
Bettering business methods.

The convention should be open to all dealers in minerals, mineralogical supplies, gems, books, and kindred items.

We are heartily in favor of such a convention as we believe it would do much good in more ways than one and we further believe the logical place of meeting should be in New York City. Suggestions are desired from all those interested as to how the meeting should be conducted and how it should be financed. Address all communications to the Editor, ROCKS AND MINERALS, Peekskill, N. Y.

Peter Zodac

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Vol. 14, No. 4

The Official Journal of the ROCKS and MINERALS ASSOCIATION

Whole No. 93

A NEW ENGLANDER DISCOVERS GALENA

By MISS VERA ROOT SMITH

This article won second prize in our recent Prize Article Contest. (Editor).

Since my discovery of Galena, Illinois, I have had recurrent urges to return—to explore more mines; to find more attractive mineral specimens and fossils; and to acquire more knowledge of the town itself both as it is today and as it was in its colorful and glamorous past.

Galena has proven of interest to geologists, mineralogists, and paleontologists—not to mention archaeologists, artists and writers.

Let me remark in the beginning, that, at the present moment, my enthusiasm for Galena far exceeds my knowledge of it. It is the fun I had in gaining the informtaion I do have, that leads me to wish to share some of it with you—in the hope that you, too, perhaps, may go to Galena someday and discover for yourself its charm and interest.

When I left the East two years ago to accept a teaching position in Rockford, I was prepared to find Illinois about as flat and unattractive and treeless as the proverbial pancake. Like most Easterners, I found the lack of rocks and hills and valleys and woods, fearfully monotonous until I got used to it.

One nostalgic day, I decided to take the car and explore a little bit of the midwest. Looking over the map of Illinois, my eye lit upon the name Galena. It lit and remained there while my mental machinery began to revolve. I am an avid—if somewhat superficial-collector of tiny mineral specimens—collecting primarily for color and form. I recalled that I had in my collection a specimen of lead from Galena. Mines! I would go and find them and, maybe, get more specimens!

The word Galena stirred up, also, some vague and undefined memories: there seemed to hang an aura of romance about Galena in Illinois. From the map, I observed that the town was on U. S. Route 20 (one of the principal east-west highways). It was tucked away up in the northwestern corner of the state very near the Mississippi—a near neighbor of Hazel Green, Wisconsin, and of Dubuque, Iowa. It is about ninety miles from Rockford and about one hundred and eighty from Chicago.

And so it came about that I took my hammer, my mineral bag, and my dog; and clambered into the car and set sail for Route 20 and points northwest of Rockford. A pleasant surprise was in store for my homesick New England eyes.

U. S. 20 is, of course, an excellent highway. Traveling westward, one eventually leaves the monotonous flatness so characteristic of the mid-west. The road becomes winding, and up-and-down-hilly. The landscape roughens, and pock-marked rock outcroppings may be seen. There are more streams, more trees, and charming gentle little valleys.

North of Route 20 between Stockton and Elizabeth, lies Apple River Canyon State Park. The road to it is well-marked, and if one has time for a detour, one may find a pleasant wooded park with picnic facilities plus an interesting "canyon" cut by the Apple River thru limestone.

Extreme northwestern Illinois looks something like New England. I am especially reminded of a section of Connecticut which lies between the Naugatuck and the Housatonic Rivers. Galena, itself, is like Seymour, Conn. —with streets and houses apparently in tiers on top of one another. But the Galena landscape has a charm peculiarly its own, which is due, I think, to the unique mounds and rambling ridges.

Many of the roads in the vicinity traverse the flat tops of ridges. U. S. Route 20 goes over Terrapin Ridge, where a wide panoramic view unfolds on both sides of the highway. Tidy little farms nestle among groves both on the hills and in the valleys. The landscape reminds me very strongly of backgrounds I have seen used in illustrations for fairy-tales. But in spite of the rough contours, the skyline seems relatively even—indicating an old former peneplain.

This country is a part of what geologists have called the "driftless area". The whole area includes a small part each, of Illinois, Iowa, Wisconsin, and Minnesota. Within its boundaries, the topography contrasts strikingly with the level, or low-rolling, prairie. Altho the glaciers scoured the surrounding land; within the "driftless area", they left little drift and practically no boulders in their wake.

All of the rocks here are sedimentary and of marine origin. The youngest of them is named Niagara dolomite. It is a magnesian limestone and gets its name from the fact that the fossils found in some of its layers resemble the fossils in a similar formation in New York. It is cherty, containing many fine-grained nodules, which vary from white to dark grey and brown. The rock itself is very rough and is light yellow-grey. It is hard and resistant to the elements, which fact has brought about some of the peculiar contours. The ridges have flat tops of Niagara dolomite and some of the mounds are flat on top—the tops having a rectangular character, before sloping away gently underneath. Some odd outcroppings on the sides of the hills look like coffins or old tombs. The Niagara dolomite underlies all the steeper contours around Galena. It contains fossil corals and brachiopods.

Underneath this Niagara formation, lies the soft Maquoketa shale. Where one notes the valleys gently sloping downward to their streams, one may know that the bed-rock is this relatively soft shale. It is usually light blue-grey, and is very fossiliferous. In it, one can find many small pelecypods (clam-like shells), gastropods (snail-like shells) and irregular masses called "slugs". At some locations, they say this shale is very

bituminous—20% organic—and that one can light it with a match.

Beneath the Maquoketa shale, is the Galena dolomite, which is the ore-bearing rock of the region. In appearance, it somewhat resembles the Niagara dolomite, being of the same color and also very rough. It seems to me more pitted and "pock marked". In fact, I wondered, flippantly, whether the Small Pox Creek one crosses while on Route 20, was named after the rock, or whether the rock also succumbed to the epidemic which ravaged the vicinity in the days of the pioneers.

My first trip to Galena terminated at the Old Black Jack Mine. This is about 3½ miles south of the business section. Before really getting into the town when traveling west, the highway pass thru a rock cut and then goes down a hill. You turn left on the first street at the foot of the hill, bearing left on this good dirt road. When you come to a fork, bear right, up the hill past the little schoolhouse. (I have heard that trilobites have been found near this school.) The next left fork will take you to the mine. They are working for roadstone there and you cannot miss the great piles of crushed stone and gravel.

Each time I go there, the appearance is different. I suppose, in time, they will have used up all of the mine dump. However, there was still quite a bit of ore last September (1938)—and plenty of specimens to be found.

The Black Jack was formerly known as the Marsden Lode, and the Peru Mine. It is one of the "younger" tho one of the most famous of the Galena mines. In 1854, when Mr. Marsden was digging a ditch in order to clean out a spring, he happened

Black Jack Mine.

Black Jack Mine Dump.

upon some galena, and later he found a small cave which was lined with galena, sphalerite, and iron sulphide. The ore here occurs in cracks and crevices and geodic caves. Some of the latter have yielded remarkably fine specimens—masses of great beauty containing galena, calcite, and pyrite crystals.

This mine has not been worked since 1908 and its buildings and machinery are in ruins. According to a map, it apparently had four shafts. Two of these are relatively near the road. I think I located one of these altho it was nearly filled with earth. Certainly I located the other. Altho it is partially covered with boards and debris, one can look away down into its spooky darkness. I understand that all the Galena mines, with the exception of the Royal Princess, were operated by means of vertical shafts.

Speaking of shafts, I have also peered down the shaft of the present Gill-Fisher Mine. I think this may be what was once known as the Pilot Knob Mine. Certainly it is near Pilot Knob—a mound used as a landmark by the Mississippi rivermen long ago. To reach this mine, follow directions as for the Black Jack until you reach the last fork, then bear right. The workings are on the right just before you go up a hill. They are near the road but not easily seen. We reached it by means of a narrow down-and-up dirt drive. I think there were two shafts here, but I have only found one to date. I was told that this is the only mine in the Galena immediate environs that is being worked today.

It was surrounded by many new strands of barbed wire. I imagine this means that visitors are not welcome. However, I did not see any Keep Out signs, so I just laid down and rolled under the barbs, while the little dog looked at me in amazement before crawling after me. Everything here looked very neat and businesslike. The shaft is neatly covered by a wooden top operated by means of a rope and weights. The shaft is vertical and strongly shored up with heavy logs. A long ladder extended into the depths. I could not see the bottom, but I believe shafts hereabouts are generally about fifty or sixty feet deep. In a drum nearby were a few fragments of partly crystallized galena. All I saw in the dump was dolomite. I was hoping that Mr. Gill or Mr. Fisher would appear and tell me something about their mine, but they didn't.

As for the Black Jack, it is said to have yielded over eight million pounds of mineral. At first, the zinc ore, popularly called "black jack", was thrown on the dump as waste. The mine was worked only for its lead until 1883 when the value of the zinc was realized. Thereafter it was worked primarily for the sphalerite.

The dump at the Black Jack fascinates me. Calcite is a very common gangue mineral—both massive and in crystals. It is white to colorless. I have several pretty clusters of quarter-inch crystals and also several isolated crystals about an inch long. There are lots of pretty little crystal groups in cracks and crevices, but I have found it very difficult to get them without ruining them. The surrounding rock is very hard and one needs the right tools plus the patience of Job.

Cubic galena crystals are relatively easy to find, altho I have not seen any large clusters of them. My specimens contain about four crystals each and the biggest crystal is only about half an inch. Massive galena is also pres-

ent. The lead is frequently attractively mixed with calcite, etc. Much of the dump material is badly weathered, and coated and shot thru with limonite. Fortunately, however, vicious use of the hammer will uncover the yellow-silver marcasite—often in the fibrous radiating form. Small iron pyrite crystals are extremely common as coating on large chunks of the ore. Both the marcasite and the pyrite tarnish beautifully and they fooled me into thinking I had specimens of chalcopyrite and bornite. In fact I had a number of specimens so labeled, until I learned that chalcopyrite is very rare here.

In the sunshine, sensitive eyes will find this dump a riot of color. For example, not far from the road is a mass—roughly to be described as a seventeen inch cube—which is covered with a veritable moss of glistening peacock-blues-and-greens (pyrite) attractively sprinkled over the top with black crystals. The latter may be galena, but they are not in the cubic form.

Probably due to ignorance on my part, I have not found any cerrusite and barite; nor have I found the "dry bone" variety of smithsonite—altho these minerals occur in this vicinity. I have found an interesting soft grey fibrous mineral which looks like weathered marcasite. It seems to answer the description of melanterite.

Sphalerite or "black jack" is easy to find. There are pleasing pieces of combinations of this with calcite and galena.

My biggest and prettiest "find" from this mine contains dolomite, rhombic calcite crystals, silvery marcasite, and pyrite crystals that are tarnished coppery red, and iridescent gold, blue, and green. I use it for a paper weight. It may well be that the experienced mineralogist would not get much of a thrill out of the Black Jack Mine, but I believe some of the amateurs, like myself, will find it a little paradise.

The amateur paleontologist, too, should be pleased with the fossils, which are plentiful here. The Galena dolomite contains brachiopods (shells with radiating grooves), pelecypods, and receptaculites oweni, that intriguing "sponge-coral" which so resembles the center of a sunflower that it is popularly known as "sun-flower coral". I always get a kick out of finding receptaculites, in spite of the fact that it is quite plentiful. When found endwise, it presents a ladder-like appearance. This fooled me, so that I believed, at first, that I had two different varieties of fossil. It might be well to remark, that extracting this fossil intact from the tough Galena dolomite, is not too simple a matter.

Incidentally, I have found "horn coral" fossils; and very showy specimens in white and transparent quartz (partly in tiny crystals) of favosites ("honey-comb coral"), in a quarry right here in the city of Rockford.

The vicinity of Galena is covered with the remains of old mines, drill-holes, and diggings. Unfortunately I have practically no first-hand information from native Galenians. Apparently all know of the Black Jack, since every time I have made inquiries about mines, I have been directed there. We had been to Galena twice before learning of the mine dumps at Hazel Green, Wisconsin; and four times before learning of the Gill-Fisher Mine.

The Hazel Green Mine dumps are about ten miles north of Galena on Route 80. To get to the place,

continue on Route 20 about three miles west of Galena; then turn right into 80. The dumps I visited, were on the right, and visible from Route 80 providing one looks sharply. We visited one of them via a short and winding—not to mention bumpy—dirt road. The mine was in ruins and many trucks were driving in and out loaded with road material, for, here too, the stone crusher had been very industrious. It was scorchingly hot, and the little dog dug herself a hole in the shade and threw herself into it. Because of the heat, I did not stay at the dump long enough to search with any degree of thoroness. The specimens I did secure were attractive, and similar to those I found at the Black Jack. They included pyrite, marcasite, galena, sphalerite, melanterite, calcite, dolomite with receptaculites, and limonite.

My first vague notion that there was something romantic about the town of Galena was correct.

From 1840 to 1855, Galena was the metropolis of the northwest. Adventurers, gamblers, and miners flocked there. Some of the miners and other pioneers came from across the ocean —from England, Ireland, Wales, and France. For miles around, the country was peppered with furnaces and smelters. In 1855 as many as fifteen steamboats were at Galena's wharf at one time. Many of the early settlers came up the Mississippi, bringing their slaves along with them. Some of the old homes in this town were built with series of small rooms for the negroes. Some slaves worked in the mines; some on the wharves and in the boats; while the rest were household servants.

Today one may see homes that are built around the original log homes of the pioneers.

Little vine-covered Grace Episcopal church appears to be hewn from the limestone bluff. This was built during the times of prosperity and its stained-glass windows came from Belgium, while its tiny organ came from Philadelphia—via New Orleans, the Mississippi River, and the Galena (or Fever) River.

Route 20 crosses the latter "river" just before one reaches the business section which is plainly seen to the right of Route 20. The Galena River, except at flood time, is a mere trickle today—giving no hint of the days of the busy wharves teaming with negro roustabouts who loaded the lead pigs aboard the big river boats.

Lead and zinc were shipped down the river by way of St. Louis and New Orleans to New York. And a number of the more prosperous inhabitants received furniture and various other supplies over this same route.

Many factors contributed to the downfall of Galena, which was a thriving town when Chicago was a mere handful of cabins. The gold-rush to California diverted the stream of miners and adventurers; the coming of the railroad and the opening up of the Joplin mineral district competed too strongly with the town which had to depend on river transportation; the Galena River silted up, due partly to unwise cultivation of the land, and became no longer navigable; and, the near-the-surface deposits of ore having been exhausted, mining became much more difficult and expensive. And so it was, that Galena's importance waned. Today most of the inhabitants—about 4,000—engage in farming, stock raising and dairying.

Galena is conspicuous for its nu-

merous steps and for its terraces and retaining walls made of the native rock. Its bluffs were cut back to make room for the homes and churches. Some of its streets are amazingly steep and some of them seem to end at "jumping-off-places".

In order to take some pictures, I climbed one series of stairs consisting of two very long flights. If I rememebr correctly I finally found myself in a position which might be described as "four streets up". On achieving this height, I felt quite exhausted and both the little dog and I threw our breathless forms down on the top step and panted like steam engines for several minutes before we could summon up enough energy to take the pictures.

Galena, by the way, is full of pictures. The late Lorado Taft—famous sculptor—visited Galena frequently. He admired it greatly and urged that its aesthetic charm be preserved. Many charming paintings and prints have been made of Galena streets and buildings. I understand that Mackinlay Kantor has written a poem about the famous High School Steps which rise to the awful height of one hundred feet.

The novel of Civil War times, *Bright Land* by Janet Ayer Fairbank was inspired by the colorful history of Galena.

Those interested in architecture will be pleased in the decided southern note evident in so many of the substantial mansions. I have never seen eagle's nests; but the Galena homes remind me of them. Surely one needs wings to get to them comfortably.

Tho its former importance has gone; one does not get the impression of decadence. Galena is proud of its tradition. The Ulysses Grant Home is open to the public. The main street, except for new fronts, is much as it was in the years when Galena society was awhirl with luxury. Barter of whiskey for lead between whites and Indians took place inside walls which enclose the businesses of today.

Archaeologists have been greatly interested in the Indian mounds hereabouts. These date from some early unknown tribe. One of the mounds is shaped like a horse. Six miles north on Route 80 is a serpent mound.

I am far from thru exploring Galena and its environs. I want to find some of the other old mines. The remains of the Royal Princess Mine should be south of the Black Jack Mine and very near the Mississippi River. The Ten Strike and the Merry Widow are, or were, in West Galena; the Appleton is in East Galena. And there are many more.

I want to prowl around in the fascinating antique shops in the town and I hope to find some of the inhabitants who can tell me about the "old days". Yes, there is plenty yet to be discovered; and with the discovery, fun is sure to follow my little dog and me.

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Galena, Illinois—American Guide Series.

Bulletin #21, Zinc and Lead Deposits of Northwestern Illinois.

Bulletin #26, Geology and Geography of the Galena and Elizabeth Quadrangles.

(The last two are publications of the Illinois State Geological Survey. They include many illustrations and maps.)

Galena was called "La Pointe" by the early French settlers. Later, it was

(Continued on page 120)

A UNIQUE MINERAL DISPLAY

By WILLARD WULFF

Secretary, Colorado Springs Mineralogical Society
Colorado Springs, Colorado

During the two weeks from January 22, to February 5, 1939, inclusive, the Colorado Springs Mineralogical Society sponsored a mineral display in the huge front window of the offices of the Colorado Springs Chamber of Commerce.

One reason for this large display was to acquaint the people of Colorado Springs, and anyone else who chanced to see it, with the great variety of fine minerals which can be found in the state, and, more especially, the Pikes Peak Region. Another reason was to stimulate interest in the study of mineralogy, crystallography, and geology.

A large map of the state, showing each of its famous collecting localities, formed the background. In front of this was arranged a series of white cards on each of which was placed a group of specimens labeled as to what the group was, where it came from, and giving the owner's name. From this card a string led up to the locality on the map, making it easy for those viewing the display to locate the exact part of the state from where that group of fine minerals came. It was surprising to most everyone to note how many of the strings converged in the Pikes Peak Region, within fifty or seventy-five miles of Colorado Springs.

On one side of this central exhibit was placed a large number of specimens representing practically every nation in the world, while on the other side was placed a similar showing of fine specimens from every state in the Union, each one bearing a label as before.

All of the specimens displayed were from the collections of O. A. Reese, George White, R. P. Monell, and Willard Wulff, all of whom are enthusiastic collectors and who have many very fine specimens.

An extremely interesting display, along with the mineral collection, was a very fine group of wooden crystal models, illustrating each of the systems of crystallization, with modifications of each system. There were also a number of models of various minerals occurring in these systems. The models were cut by Arthur Hubbard, a student in Cheyenne High School, Colorado Springs, and after close examination of them Mr. Lazard Cahn, our Honorary President, a recognized authority on crystallography, stated that they were extremely accurate in every way. This part of the display attracted much attention.

Another interesting item was the book, "How to Collect Minerals", by Peter Zodac, which he sent to the Club. The Chamber of Commerce has had several inquiries as to where copies of it could be obtained, and all were given the information desired. We thank Mr. Zodac for his generosity in sending us this book, and we hope he sells a lot of them from the inquiries received.

We of the Colorado Springs Mineralogical Society think this display was a "howling" success, in that it has aroused a great deal of interest in the study of mineralogy, and the collecting of minerals as a hobby. Also

there are many people who do not know that crystals "come that way". They have the idea the crystals have been cut and polished to give those sharp angles and bright faces. Even after seeing them, there are a considerable number of those "Doubting Thomases" who still don't believe it. However, thru displays of this kind more and more people are learning something about Mother Nature all the time.

The Chamber of Commerce here has asked the Club to repeat this showing during the summer for the benefit of the thousands of visitors who spend their vacations in Colorado Springs.

CRANBROOK MUSEUM ACQUIRES NOTED ADDITIONS

About five hundred mineral specimens of unusual quality have been acquired by the Cranbrook Institute of Science through the generosity of several friends. Notable among these are a perfect crystal of hiddenite, about the diameter of a lead pencil and about two inches long; three sections of large zonated Madagascar tourmalines, which are exhibited as transparencies; a large slab of datolite of spectacular pattern; several showy specimens of Michigan crystalline and arborescent silver; a specimen of Michigan copper with several perfect duodecahedral crystals of large size; a cluster of golden calcite crystals from Monroe, Michigan, of unusual size for specimens from this region; and a slab of large apophyllite crystals, about eighteen by twelve inches.

CALIFORNIA FEDERATION MEET

By CLARK HARRISON

The California Federation of Mineralogical Societies will hold its annual convention and banquet in the San Bernardino Junior College at San Bernardino, California on April 15-16 (Saturday and Sunday), 1939.

World famous speakers are scheduled to give short talks in the spacious auditorium of the college, as well as a showing of Dr. Hatfield's colored motion picture films on geological subjects—one of the finest in the country. Dr. Woodhouse of Santa Barbara will have on display his collection of opals—one of the finest in the country. Ample time will be allowed for trading, visiting, viewing exhibits, etc.

There will be special display rooms for exhibits, trading, and instrument dealers, as well as two special rooms for the demonstration of fluorescent and phosphorescent minerals. Prizes are offered for competing exhibits and displays. Efforts are being made to have representation and exhibits from all the mineralogical societies of all the western states. A very large attendance is expected.

The famous Golden Bear Nugget, which has been on display at the State Bureau of Mines at Sacremento, has been purchased by the Federation and it has been made the official insignia, which will appear on its stationery. It is planned to have the nugget on display.

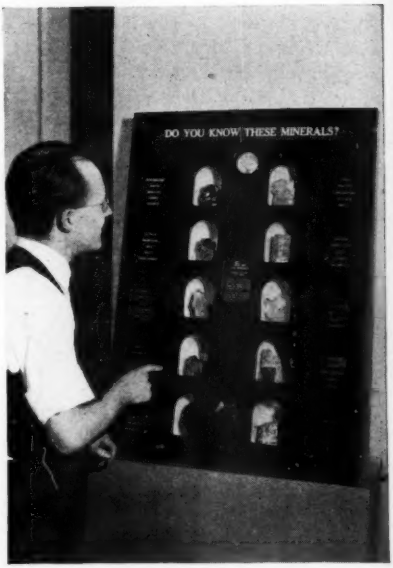
This promises to be one of the most interesting meets of the year.

ELECTRIC QUIZZER INSTALLED IN THE ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA

Visitors to the Free Museum of Natural History of the Academy of Natural Sciences of Philadelphia can now test their knowledge of minerals on an automatic electrical quizzer.

The exhibit, designed by Mr. and Mrs. Charles J. Joung (inventor of facsimile radio transmission) shows ten common minerals. Opposite each specimen are five names and five buttons. The visitor presses the button of his choice, in each case. When he or she has pressed ten buttons, completing the examination, his or her score automatically registers upon a meter, and the correct answers flash up in red letters.

The exhibit was built by Mr. William Pitman and Mr. Theodore Kopp under the direction of Mr. Samuel G. Gordon, associate curator of the Departmen of Minerals.



Mt. Pitman testing the quizzer.

CRANBROOK CLASSES SUCCESSFUL

This year the Cranbrook Institute of Science, Bloomfield Hills, Michigan, offered its adult members courses in mineralogy and in lapidary technique which have proven popular and will be repeated on another year.

The course in lapidary technique, conducted by Mr. John F. Mihelcic meets on Saturday mornings, for two hours. Students of varying degree of previous training have been accepted —some never before having done work of the sort, one having already mastered cabochons and working exclusively on faceting. The laboratory is equipped with places for ten persons to work at once on vertical or horizontal wheels, and for stone sawing and dop stick mounting in other locations.

Two sections of the course in general mineralogy are conducted by Dr. Carl Dutton, one on Saturday mornings and one Monday evenings. The class considers the physical characters of minerals and their employment in mineral identification. The extensive collections of the Institute are made available to the students for study purposes.

SOME OF THE COMMON MINERALS FOUND IN THE NEIHART AND HUGHESVILLE MINING DISTRISTS, MONTANA.

By KIRIL SPIROFF

Michigan College of Mining and Technology

Sixty miles southeast of Great Falls, Montana, are the Little Belt Mountains which form a part of the front ranges of the Rockies. In these mountains are some of the finest examples of erosion to be found in the state of Montana. Describing the region in the Fort Benton Folio No. 55, W. H. Weed said, "The great limestone cliffs and the 'sluice-box' canyon of Belt Creek (between Logging Creek and Riceville), the fantastic sculpturing of Square Butte, and the adjacent bad lands of Arrow Creek are the most remarkable scenic features of the region." Unforgettable, also, is the abrupt rise of the mountains from gently sloping terraced levels whose open grass land forms a strong contrast to the wooded mountain slopes. It is the mental pictures of this area that the cowboy artist Charles Russell so aptly transferred to canvas in his celebrated Western paintings.

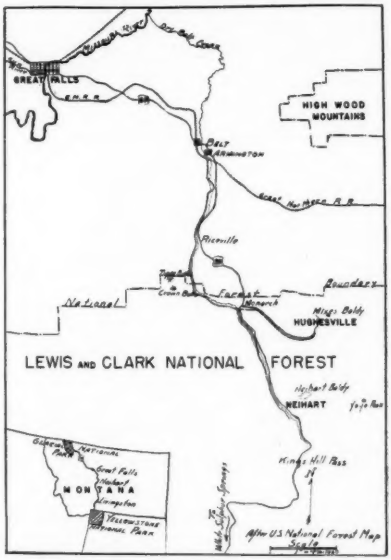
Speaking geologically, W. H. Weed states that the Little Belt area is a part of a broad mountainous uplift, the general structure of which is a wide arch with a flat summit and steeply inclined sides, much modified by local arches due to igneous injections. He further says that the stratified rocks represent the various formations from the Cambrian to the Mesozoic Age.

In these mountains there are many prospects, but only a few large mines. Hughesville and Neihart are the important mining camps. They are located on the Park-to-Park Highway and consequently are easily reached by motorists.

The ore deposits around Hughesville are mined mainly for lead and zinc; those of the Neihart district chiefly for silver, although lead, copper, and gold have also been recovered. Molybdenum has been found, but is not yet of commercial importance.

In the vicinity of Neihart the following minerals can be collected:

Galena, which occurs as coarse-to fine-grained cleavage fragments. It is a lead-gray metallic mineral, with



Map Showing Location of Neihart and Hughesville, Montana

three perfect cleavages at right angles. Other characteristics are high specific gravity, lead-gray streak, and hardness which is the same as that of a fingernail. In druses at Broadwater and other mines, galena crystals of the isometric system (cubes with truncated corners) are to be found. Chemical composition—PbS, lead sulphide.

Sphalerite, fine- to coarse-textured, either massive or disseminated. The color may be black, honey-yellow, or green. Sphalerite has a very high (adamantine) luster and six cleavages parallel to the faces of a dodecahedron. It has another distinguishing feature—the odor of burning sulphur which it gives off when rubbed on a streak plate. Beautiful complex crystals of sphalerite are found with galena and pyrite in druses at the Broadwater mine and mines along Belt Creek. Chemical composition—ZnS, zinc sulphide. The black to dark brown variety is marmatite, an iron-rich sphalerite.

Pyrite, which is very abundant in the veins as well as disseminated in the country rock. Because of its yellow, brassy color it is often mistaken for gold, and is thus dubbed "fool's gold". Pyrite is very easily distinguished from gold by its streak; the former has a greenish black streak. Small cubic or pyritohedral crystals are very common. Chemical composition—FeS_2, iron sulphide.

Chalcopyrite, a light yellow-brassy mineral, often having an iridescent tarnish. It occurs intergrown with pyrite and the other sulphides. It can be easily distinguished from pyrite because it is relatively soft and is readily scratched by a knife, while pyrite is not. Occasionally sphenoid crystals showing four equilateral triangles are found. Chemical composition—$CuFeS_2$, copper iron sulphide.

Polybasite, which is found as iron-black, platy crystals with triangular striations and beveled edges. The streak is black. The hardness is that of a fingernail. Chemical composition—$9Ag_2S.Sb_2S_3$, a silver antimony sulphide.

Pyrargyrite, which occurs as grayish-black, long, slender, hexagonal-appearing crystals. The top of a crystal may have three, or a multiple of three, faces. The mineral also occurs as a massive coating or as filling material in cracks. The color is grayish, with deep red internal reflections. The streak is purplish-red. Chemical composition—$3Ag_2S.Sb_2S_3$, a silver antimony sulphide.

Proustite, similar to pyrargyrite and difficult to distinguish without a chemical analysis. The crystals are usually short and rhombohedral. Chemical composition—$3Ag_2S.As_2S_3$, a silver arsenic sulphide.

Molybdenite, which occurs as a lead-gray, flaky mineral showing one perfect cleavage. The streak is bluish (lead) gray. It is soft enough to write on paper. It closely resembles graphite. The Big Ben Mine has the largest available tonnage of molybdenite. Chemical composition—MoS_2, molybdenum sulphide.

Qaurtz, a hard mineral with a conchoidal fracture, occurring both in small hexagonal crystals and in massive form. The best crystals are found in the neighborhood of Snow Creek.

Siderite, a dark brown mineral having three perfect cleavages at 75 degrees. It is usually coated with iron rust (limonite). On the dumps some of this siderite is mistaken for

limonite. Chemical composition—$FeCO_3$, iron carbonate.

Barite, a white, tabular mineral, found as cleavage fragments. The fracture pattern on one cleavage face is that of calcite (the angles are at 75 degrees), while on the other face the pattern is rectangular (the angles are at 90 degrees). Therefore, barite has two like cleavages at 75 degrees to each other, and a third, different in degree of perfection, at 90 degrees to the other two,—prismatic and basal cleavages. Crystals with faces parallel to the cleavages are to be found. Barite is heavy; the specific gravity is 4.5. Its hardness is that of a penny. Chemical composition—$BaSO_4$, barium sulphate.

Cerussite, a white mineral with adamantine luster and high specific gravity. It is soft and brittle. When in clusters the crystals appear hexagonal and prismatic. Chemical composition—$PbCO_3$, lead carbonate. Some of the material found with the cerussite is probably anglesite, $PbSO_4$, a lead sulphate. Both are alteration products of galena. The two minerals are readily identified by a simple chemical test—cerussite effervesces in nitric acid, while anglesite does not.

Malachite, a radiating, green, silky, fibrous mineral having botryoidal or stalactic surfaces. On close observation cleavages can be observed parallel to the fibers and to those botryoidal faces which form an angle of about 60 degrees to the fibers. The streak is green. Chemical composition—$CuCO_3.Cu(OH)_2$, a basic cupric carbonate.

The minerals at Hughesville are similar to those found at Neihart. At the Block P Mine dump most of the purplish gray rock is a syenite prophyry, the recognizable mineral being orthoclase. There is also a dense dark rock with glassy white phenocrysts, which the miners call "bird's eye porphyry". The phenocrysts are sanidine, a variety of alkali feldspar. Samples are also found of a sulphide vein cutting the syenite porphyry. The vein consists of banded sulphides of galena, sphalerite, and pyrite. The gangue mineral is mainly quartz with occasional carbonates.

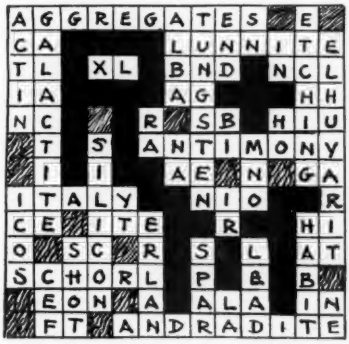
Pyrite appears in stringers and disseminated grains. At the Moulton and Tiger Mines beautiful cubic crystals with velvety, colored coatings are to be found.

Galena is especially common in lenticular-shaped fragments, the texture of which is coarsely crystalline in the center and very fine on the edges.

Sphalerite, the black colored variety (marmatite), predominates.

Barite appears as tabular plates. Rhombs of calcite and rhodochrosite are found in druses. These are common at the Moulton.

..*Orthoclase* phenocrysts showing zonal growths are found in the granite talus at the Mixes Baldy Peak.



Last month's Cross Word Solution.

NEPHRITE AND JADEITE IN WASHINGTON

During the summer of 1935, while prospecting a steatite (talc) occurrence near Mt. Vernon, Wash., James Griffith Stephens, of Seattle, ran across a dark green mineral the like of which he had never before seen in the northwest. Samples of the mineral were sent to the offices of ROCKS AND MINERALS, Peekskill, N. Y., where they were identified by the editor, Peter Zodac, as nephrite. Samples were later sent to the Washington State Division of Geology, Pullman, Wash., where John W. Melrose verified the nephrite and furthermore recognized another mineral as jadeite.

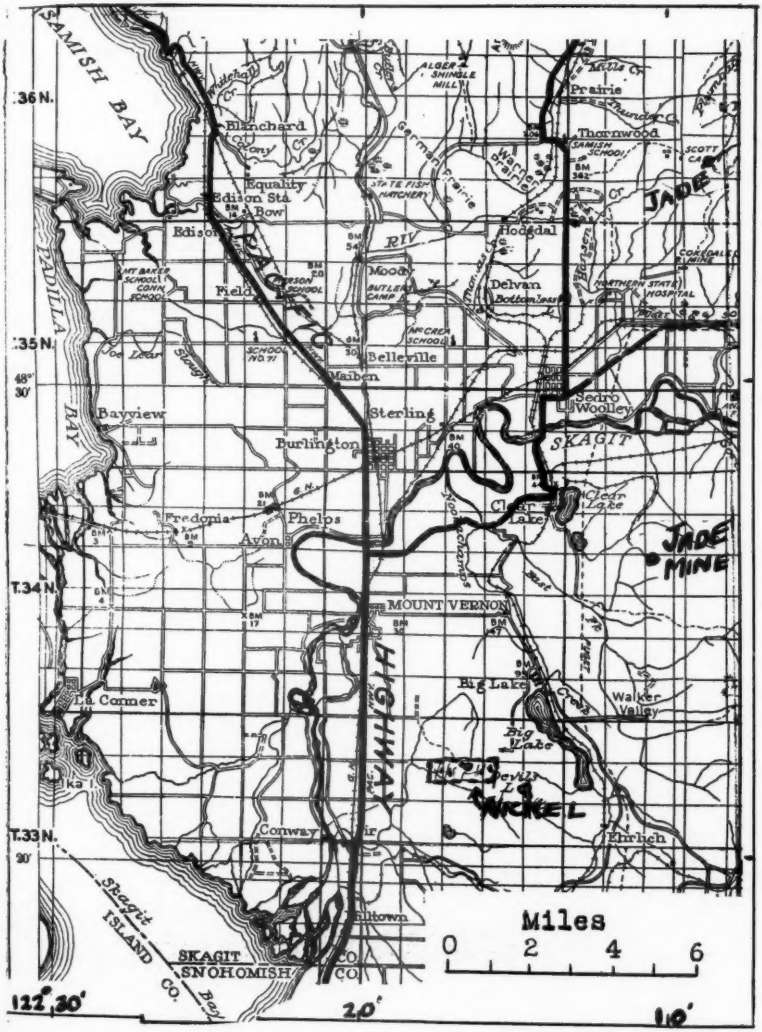
The finding of these two minerals in the state of Washington was of more than passing interest, not only because the occurrence of nephrite and jadeite is very rare in this country, but in addition the minerals were found actually *in situ* (in place), an occurrence which is rare in any place in the world, and the first known in the Western Hemisphere.

James Griffith Stephens is a member of the Rocks and Minerals Association and a very prominent prospector. His experiences in western United States, Canada, and Alaska were so extensive and wide that for many years he conducted the Stephens School of Prospecting which had students in all parts of the country. Due to the free courses in prospecting now given by the Government, he has been forced to abandon, temporarily at least, the school which is located at 4541 5th Ave., N. E., in Seattle.

Since the discovery of the nephrite and jadeite, Mr. Stephens has had time to acquire title to the property in the form of a 20 year renewable lease (obtained July 20, 1938) from the State of Washington, on a tract of land whose area is 40 acres. He has also sunk a shaft and mined a few hundred pounds of the material. As nephrite and jadeite have great commercial possibilities, and especially in China, mining for the minerals on a systematic scale will be attempted but not until the war in China is over. In the meantime 20 lbs. of the material has been sent to China as a trial shipment while an additional 20 lbs. have been sent to Idar, Germany, for cutting. Another 20 lbs. have been donated to the State Museum at Olympia.

The Stephens Jade Mine is 6 miles due east of Mt. Vernon, Skagit Co., in northwestern Washington and is on the southwestern flank of Cultus Mountain (an Indian (Chinook) word meaning "no good"). The elevation of the mine is 1500 ft. above tide (Cultus Mountain is 4089 ft.) and it is located on logged land owned by the State of Washington. An auto road leaves the main paved highway at the town of Clear Lake and at a distance of 3½ miles ends within 400 ft. of the inclined shaft. The location of the mine may also be given as 48°26'30" N. Lat. and 122°11'00" W. Long.

The inclined shaft, dipping 70° to the northeast, is only 35 ft. deep, and has been sunk in the vein which strikes nearly true north and south and which in turn dips 70° to the northeast. The vein is 8 ft. wide and is chiefly talc in which nephrite and jadeite occur as lenticular masses. The footwall of the vein is serpentine and the hanging wall is slate; jadeite occurs near the hanging wall. Though the jade thus found is not of imperial (Chinese) quality, it is believed that its quality will improve with depth.



Map showing location of Stephens Jade Mine and the Jade Occurrence 10 miles north of the mine. Mr. Stephens has also a valuable nickel prospect (Pacific Nickel Co.) which he is now working and whose location is also shown on the map.

The alluvial soil which blankets the vein is rich in loose masses of jade which, surprising as it may seem, is of better quality than the mined product. This parallels the conditions in Burma where jade boulders gathered from stream beds always command a higher price than the mined mineral. So far Mr. Stephens has gathered about 300 lbs. of the alluvial jade which is stored awaiting purchase. The alluvial jade appears to be plentiful and several streams near the mine also contain it in the form of boulders. One boulder must weigh about 200 lbs. and is so tough that blows from a 16 lb. double jack hammer make no impression on it.

Though Mr. Stephens discovered the jade occurrence, two of his students, Loran and Earl Scott, brothers, of Sedro Woolley, Wash., did the actual developing and to them due credit must be given for the progress made. They have also traced the contact and have found jade at a point 10 miles north of the original discovery where they own 160 acres.

The occurrence of jade in situ is of rare occurrence. Its most noted locality is Uru Valley in the Myitkyina district of Upper Burma where it occurs in dikes of a metamorphised rock in a country-rock of serpentine[1]. Nephrite has been found in situ in several places in Europe. Indeed the largest mass was found by Dr. Geo. F. Kunz[2] at Jordansmühl in Silesia, in April, 1899, and weighed 4704 lbs. This huge mass is on display at the American Museum of Natural History, New York City. In New Zealand[3], nephrite has been found in situ, in the form of rounded segregations up to two feet across, in talc and talc-serpentine rocks in the Griffin Range. This formation is identical with that of the Stephens mine. Recently, nephrite has been found in situ in the Lytton area of British Columbia, Canada[4]. The locality is about 100 miles north of the Stephens Jade Mine though in the same mountain system and in a similar geological formation. But the Stephens occurrence was found over three years ago and it has the distinction of being the first authentic occurrence of nephrite and jadeite in situ on the Western Hemisphere.

Many jadeite ornaments and beads have been found in Mexico, in graves, tombs, and other remains of ancient Mexicans. The source from whence the jadeite originally came is unknown as the material has never been found in the rough state. Nephrite is also known from Alaska but the various reports which list it do not say whether it is in the form of rough boulders or in the form of ornaments. At least it is not in situ.

MINERALS OF THE DEPOSIT

The name jade includes two distinct minerals, nephrite and jadeite. Nephrite[5] is the more common of the two and it is placed with the amphiboles. It has an exceedingly tough structure so that it is difficult to break, even with heavy blows, and when it does it has a splintery fracture. Its hardness is 6.5; sp.gr. 2.9 to 3.1; while its color which is often irregularly distributed, varies from white to leaf-green and dark green, the green being due to ferrous iron. Nephrite has a

1 *A key to precious stones.* By L. J. Spencer (London, 1936) p. 213.

2 *The curious lore of precious stones.* By Geo. F. Kunz (New York, 1938) p. 250.

3 *Gemstones,* Imperial Institute publication (London, 1934) p. 80.

4 *The Gemmologist* London, Oct. 1938, p. 35.

5 Kraus and Holden *Gems and Gem Materials* (New York) 2nd Ed. 1931, p. 180.

Mt. Cultus showing location of Stephens Jade Mine on its southwest flank. Looking northeast from Scott Mt. (Pacific Nickel Co's prospect), snow-capped mountain in distance is Mt. Baker, 25 miles away. Body of water is Big Lake.

glistening luster and is translucent and opaque. Its composition is $Ca(Mg,Fe)_3(SiO_3)_4$.

Nephrite from the Stephens Jade Mine is dark grayish-green in color with a splintery fracture. It takes a very nice polish which is much darker in color than the unpolished material. The mineral has many soft spots of dark gray talc, however, which is not exactly a detriment as these spot areas can be removed by skilful Chinese carvers; furthermore the quality of nephrite should improve as the mine is deepened.

Small tunnel opening at the Jade Mine showing surrounding talc rock (while). Figures in pictures are Mrs. Stephens and her young son.

Jadeite[6] is placed with the pyroxene group of minerals. Like nephrite it is tough and compact, and has a splintery fracture. Its hardness is 6.5 to 7 and sp.gr. 3.3. A specific gravity determination will, therefore, serve to distinguish the two minerals. The color is white or greenish-white to emerald-green. Its luster is subvitreous to pearly; translucent to opaque. It is a sodium aluminum silicate, $NaAl(SiO^3)^2$. Jadeite is not as tough as nephrite and it fuses more readily.

At the Stephens Mine, jadeite has a dark grayish green color with a greasy luster. In thin splinters, it is translucent. Many of the specimens are streaked with black inclusions, somewhat similar to chromite in serpentine. The mineral takes a nice polish.

Serpentine: As would be expected, this is very common and occurs in a number of types. One is a very dark green compact type that takes a nice polish. Another is a gray-green variety with a greasy luster and is apparently marmolite.

Talc: Apple-green in color, foliated-compact and makes nice specimens.

There is also at times a showing of amphibole asbestus and sepiolite (meerschaum) but not in amounts worthy of more than a mention.

6 Kraus and Holden, op. cit. p. 180.

ANOTHER MINERALOGICAL GROSSWORD PUZZLE

By WALTER P. SACHS

ACROSS

1—A crystal form with twenty-four equal faces, each a trapezoid, common with garnet.
11—An imaginary line around which crystal faces are symmetrically aranged.
14—In Norse mythology, the god of the stormy sea, after whom a silicate has been named.
15—Author of "A System of Mineralogy."
16—Bauxite is an ore of this metallic element (symbol).
17—Dysprosium (symbol).
18—Thenardite is a sulphate of this element (symbol).
19—A mountainous district in W. Austria, famous as a mineral locality.
20—Classification of a mineral containing tellurium.
23—An element, component of lorandite (symbol).
24—A locality in Norway, from which a niobate of the yttrium metals derives its name.
26—Iodine, tantalum (symbols).
27—Indium (symbol).
28—Cerargyrite is a chloride of this element (symbol).
29—Formula of massicot.
32—May be used as a streak plate.
33—Millerite is a sulphide of this element (symbol).
34—Lanthanum (symbol).
35—The two elements which combine to form bismuthinite (symbols).
38—Geological Text (abbreviated).
39—Iridium (symbol).
41—This element and copper are components of weissite (symbol).
43—This element and mercury are components of tiemannite (symbol).
44—Anhydrite is a sulphate of this element (symbol).
46—Yttrium (symbol).
48—Europium (symbol).
49—Lutecium (symbol).
50—Samarium (symbol).
51—Scandium (symbol).
52—..... of Mine (said of coal).
55—Commercial kaolin is produced from this southern state (abbreviation).
57—"And" in Latin.
58—A producer of fluorescence: "the iron ....."
59—First initials of the author of "A Textbook of Mineralogy."
61—Ruthenium (symbol).
62—Element discovered by the Curies (symbol).
64—The gem state of Minas Geraes is on this continent (abbreviation).
65—Aragonite is a carbonate of this element (symbol).
66—Krypton (symbol).
67—A suffix used in chemistry.
68—A malleable metallic element (symbol).
69—Orpiment is a trisulphide of this element (symbol).
70—The first two elements in the usual formula for vrbaite (symbols).
72—Oxygen, nitrogen (symbols).
73—Erbium (symbol).
74—Carbon, iodine (symbols).
75—Strontium (symbol).
76—A cape of Cornwall, England (abbreviated).
77—A metric measure (abbreviation).

ACROSS

78—Rough Ore (abbreviated).
79—German mineralogical termination.
80—Iodine, uranium (symbols).
81—Holmium (symbol).
82—Nitrogen, lanthanum (symbols).
84—Thulium (symbol).
85—Colorless, transparent gypsum (plural).
89—Fluorite occurs in this state (abbreviation).
90—Neon (symbol).
92—A possible abbreviation for "reticulated."
93—Talc occurs in this state (abbreviation).
94—A variety of variscite has been named after this state.
96—Tetragonal (abbreviation).
98—That part of the name of a city in Clark county, Nevada, after which a mineral identical with plumbojarosite was named.
100—A state famous as a tourmaline. locality (abbreviation).
101—Bromine (symbol).
102—Mineral included in the scapolites.
103—A natural compound.

DOWN

1—Mineral closely associated with columbite (plural).
2—Mineral with the formula, AsS.
3—Mineral which has no cleavage, is ductile and malleable, has hackly fracture and metallic luster, tarnishes, and its streak is silver-white (symbol).
4—A cavity in the ground.
5—The "R" in the general formula for fergusonite represents these two elements among others (symbols).
6—Few minerals have this property in a dry state.
7—Mineral with the formula, NaCl.
8—The names of two common gaseous elements of the air end with these two letters.
9—Mineral with glassy, greenish crystals, a silicate associated with the zeolites (plural).
10—A liquid hydrocarbon.
11—A common metallic element and one of the rarest (symbols).
12—Mineral which occurs as an alteration product of chrysolite at Carmelo Bay, Monterey county, California.
13—A medium- to coarse-grained, light colored rock, igneous and much like granite in appearance, but containing no quartz and not very common.
16—Two elements, components of calaverite (symbols).
21—Before (not mineralogical).
22—Lithium (symbol).
25—An element, component of quartz (symbol).
29—An element, component of galena (symbol).
30—An element, component of bismite (symbol).
31—Osmium (symbol).
36—Instrument for determining the refractive indices of crystallized minerals.
37—Zincite and franklinite are found in this state (abbreviation).
40—Mineral which is a silver antimonide.
42—Mineral bearing the Dana classification number 403.
44—A solution used in determining specific gravities.
45—Mineral of the uranite group, found in xl scales on rock,

DOWN

which shows a bright yellowish-green fluorescence.

47—Tantalum (symbol).

53—Name of a highly mineralized mountain chain in U. S. S. R.

54—A southern state where corundum occurs (abbreviation).

56—A county in Maryland after which a variety of linnaeite is named.

60—A leek-green mineral of the uranite group which occurs in a carboniferous shale from Sincos, Peru.

63—What the Romans called gold.

64—A compound formed by the neutralization of an acid (plural).

66—Mineral found associated with ulexite in southeastern Kern county, California.

71—Another name for quartz.

72—Name given to earthy limonite.

83—Name of a group of hydrous sulphates of alumium with an alkali metal.

86—Same as 73—across.

87—A mineralogist and crystallographer after whom a zeolite is named; original locality of the mineral being in the Faroe Islands.

88—Nickel, germanium (symbols).

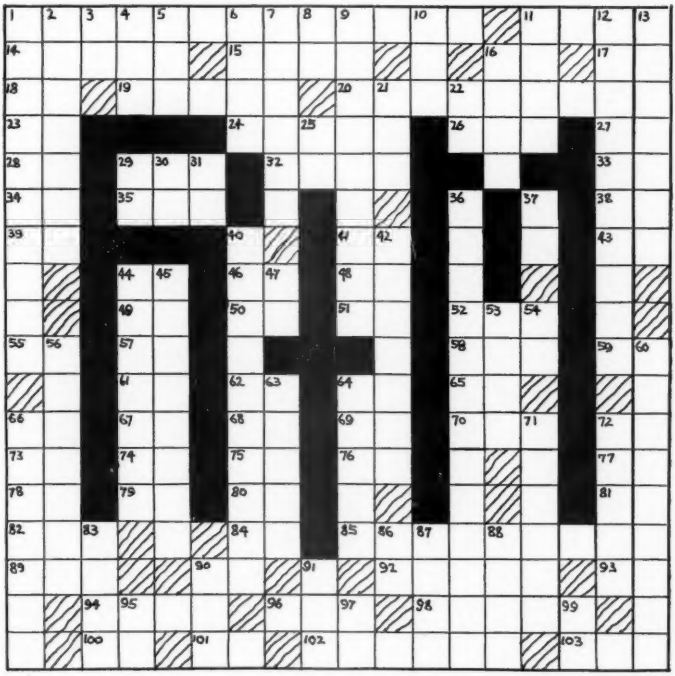
90—First three elements in the formula for ammonioborite (symbols).

91—Color of the streak of hematite.

95—Tellurium (symbol).

97—Titanium (symbol).

99—South (abbreviation).



AMERICAN MUSEUM LECTURES

The American Museum of Natural History Department of Education
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The Appreciation of Gems

By HERBERT P. WHITLOCK
Curator of Minerals and Gems

Given Saturday Afternoons at 4:00 p.m.
APRIL 15, 22, 29 and MAY 6
1939

Room 319, Roosevelt Memorial of
The American Museum of Natural History
Central Park West at 79th Street
New York, N. Y.

April 15

The Precious Stones

Describes the patricians of the gem family: diamonds, rubies, sapphires, emeralds and opals.

(Lantern Slides)

April 22

Jade: The Many-Colored Jewel of Heaven

Deals with the sources of Chinese Jade; its various colors and the primitive methods employed by oriental artists in carving it.

(Lantern Slides)

April 29

Jade: Its Carving, Mythology, and Symbolism

Explains how the Chinese have expressed in carved jade the wealth of myth and legend that is an intimate part of their lives.

(Lantern Slides)

May 6

Quartz and Other Decorative Stones

Also covers the materials such as jasper, turquoise, and lapis lazuli that are used for carved objects.

(Lantern Slides)

NEW YORK STATE GEOLOGICAL ASSOCIATION

PRELIMINARY ANNOUNCEMENT FIFTEENTH ANNUAL MEETING
May 12 and 13, 1939
St. Lawrence University, Canton, New York

FIELD TRIPS AS TENTATIVELY PLANNED

Friday Afternoon: Gouverneur marble quarries, Reservoir Hill Phacolith near Gouverneur and "Lost River", an underground portion of Boland Creek near Richville.

Saturday: Eskers, pro-glacial delta, and extinct lake features between Canton and Edwards, zinc mine at Edwards and talc mine near Fowler. Opportunity will be given to collect mineral specimens but the party will not go underground.

ANNUAL DINNER

Tickets for the annual dinner which will be held Friday, May 12, in the Men's Residence of St. Lawrence, will probably cost $1.25.

REGISTRATIONS

The party will assemble at Gouverneur, where registration will be in the Municipal Building. The registration fee will be $.25.

Please inform us at the earliest possible date if you plan on attending, and the number that there will probably be in your party.

Robert W. Brown, Pres.
Dept. of Geology, St. Lawrence Univ.,
Canton, N. Y.
John S. Brown, Sec.
St. Joseph Lead Co., Edwards, N. Y.

GALENA

(Continued from page 105)

known as the "Fever River Diggings"; and then as the "Bean River Settlement". The French called the Galena River at that time "La Riviére de Féve (Bean River).

In 1826, the citizens held a meeting to select a permanent name for the community. After much discussion, they chose "Galena"—the Latin name for the lead sulphide for which the district was famous.